

Three new species of thalassinidean shrimps (Crustacea, Axiidae and Calocarididae) from Taiwan

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ABSTRACT

KEY WORDS

Crustacea,
Decapoda,
Thalassinidea,
Axiidae,
Calocarididae,
Taiwan,
new species.

Three new species of Thalassinidea are described from deep water (350-400 m) off Taiwan: *Acanthaxius formosa* and *Acanthaxius grandis* (family Axiidae), and *Calastacus crosnieri* (family Calocarididae). The latter is the first record of the genus from the western Pacific, and the fifth species to be described. Six species of *Acanthaxius* have previously been described, five from the Pacific, and one from the western Atlantic.

RÉSUMÉ

MOTS CLÉS

Crustacea,
Decapoda,
Thalassinidea,
Axiidae,
Calocarididae,
Taiwan,
nouvelle espèce.

Trois nouvelles espèces de thalassinides (Crustacea, Axiidae et Calocarididae) de Taiwan. Trois nouvelles espèces de thalassinides sont décrites de Taiwan par 350-400 m de profondeur : *Acanthaxius formosa* et *A. grandis* (famille des Axiidae) et *Calastacus crosnieri* (famille des Calocarididae). Pour cette dernière, il s'agit de la première découverte de ce genre dans l'ouest du Pacifique et de la cinquième espèce décrite. Six espèces d'*Acanthaxius* avaient été précédemment décrites, cinq du Pacifique et une de l'Atlantique occidentale.

INTRODUCTION

There have been few publications on axiids and calocaridids from the South and East China Sea region around Japan, Taiwan, and Korea. The more recent of these include Yokoya (1933), Miyake & Sakai (1967), Sakai (1987, 1992), Sakai & de Saint Laurent (1989), Kensley & Komai (1992). In all, only about fifteen species are known from the region, none from Taiwan. The three new species described here suggest that many more await discovery in what is known to be a region of high marine biodiversity.

MATERIAL AND METHODS

All the specimens reported here were obtained from the catches of commercial deep-sea trawlers in the fishing ports of Taiwan. The fishing grounds are close to the home ports, to which the trawlers return with their catch each day. Unless otherwise stated, specimens are deposited at the National Taiwan Ocean University (NTOU) and the National Museum of Natural History, Smithsonian Institution (USNM). Carapace length (cl) is measured from the orbital margin to the posterior margin of the carapace.

SYSTEMATICS

Family AXIIDAE Huxley, 1878

Genus *Acanthaxius*

Sakai *et de Saint Laurent*, 1989

Acanthaxius formosa n.sp.

(Figs 1A, 2)

MATERIAL EXAMINED. — **Tong-Kong**, Ping Tong County, south-western coast, sandy mud bottom, about 350 m, 5.VIII.1996: holotype ♂ cl 18.0 mm (NTOU H-1996-8-5).

Paratypes: all from Tong-Kong, Ping Tong County, south-western coast, sandy mud bottom, about 350 m, 5.VIII.1995: 2 ♀♀ cl 14.9 mm, 16.2 mm (NTOU P-1995-8-5). — 5.VIII.1996: 4 ♂♂, cl 15.5-16.9 mm, 1 ♀ cl 17.0 mm, 1 ovig. ♀, damaged (NTOU P-1996-8-5). — 2.XII.1995: 1 ♂ cl 15 mm (USNM 253357). — 5.VIII.1996: 1 ♂ cl 15 mm, 1 ovig. ♀ cl 15.2 mm (USNM 253358).

ETYMOLOGY. — The specific name is from the earlier name of the island of Taiwan, *viz.* Formosa, and is used as a noun in apposition.

DESCRIPTION

Carapace (Fig. 2A, B) with rostrum reaching just beyond eyes to distal margin of article 2 of antennular peduncle, with three pairs of lateral teeth, flanked by pair of strong supraorbital spines; median carina reaching onto rostrum, bearing up to sixteen spines; lateral carina bearing nine to ten spines, anteriormost largest; two rows of small spines between median and lateral carinae, of about ten and five to six spines each; cervical groove well-marked, with few spines on dorsal edge; postcervical carapace and branchiostegites bearing numerous small spines or rounded tubercles. Pleuron of abdominal somite 1 triangular, ventrally acute; pleura 2 and 3 ventrally broadly rounded; pleura 4-6 with low ventral tooth (Fig. 2A). Telson (Fig. 2C) slightly longer than wide, with small median spine on posterior margin, two pairs of small movable posterolateral spines; two pairs of small spines on dorsal surface.

Antennal acicle slender, curved, reaching distally to base of distalmost peduncular article. Pereopod 1, larger cheliped (Fig. 2D) quite heavily setose, merus with nine spines on ventral margin, four or five spines on dorsal margin, with few scattered distolateral spines; carpus with three spines on dorsal margin, few scattered spines on lateral surface; propodal palm with five spines on dorsal margin, row of forwardly-directed sometimes overlapping spines on ventral margin, running almost to apex of fixed finger, lateral surface with numerous rounded and subacute tubercles; dactyl with ten spines on dorsal margin; cutting edges of both fingers having numerous rounded tubercles. Pereopod 1, smaller cheliped (Fig. 2E), merus bearing eight to nine spines on ventral margin, five spines on dorsal margin, few scattered distolateral spines; carpus with three spines on dorsal margin, few scattered spines and tubercles on lateral surface; propodal palm with five spines on dorsal margin,

FIG. 1. — A, *Acanthaxius formosa* n.sp.; B, *Acanthaxius grandis* n.sp.; C, *Calastacus crosnieri* n.sp.



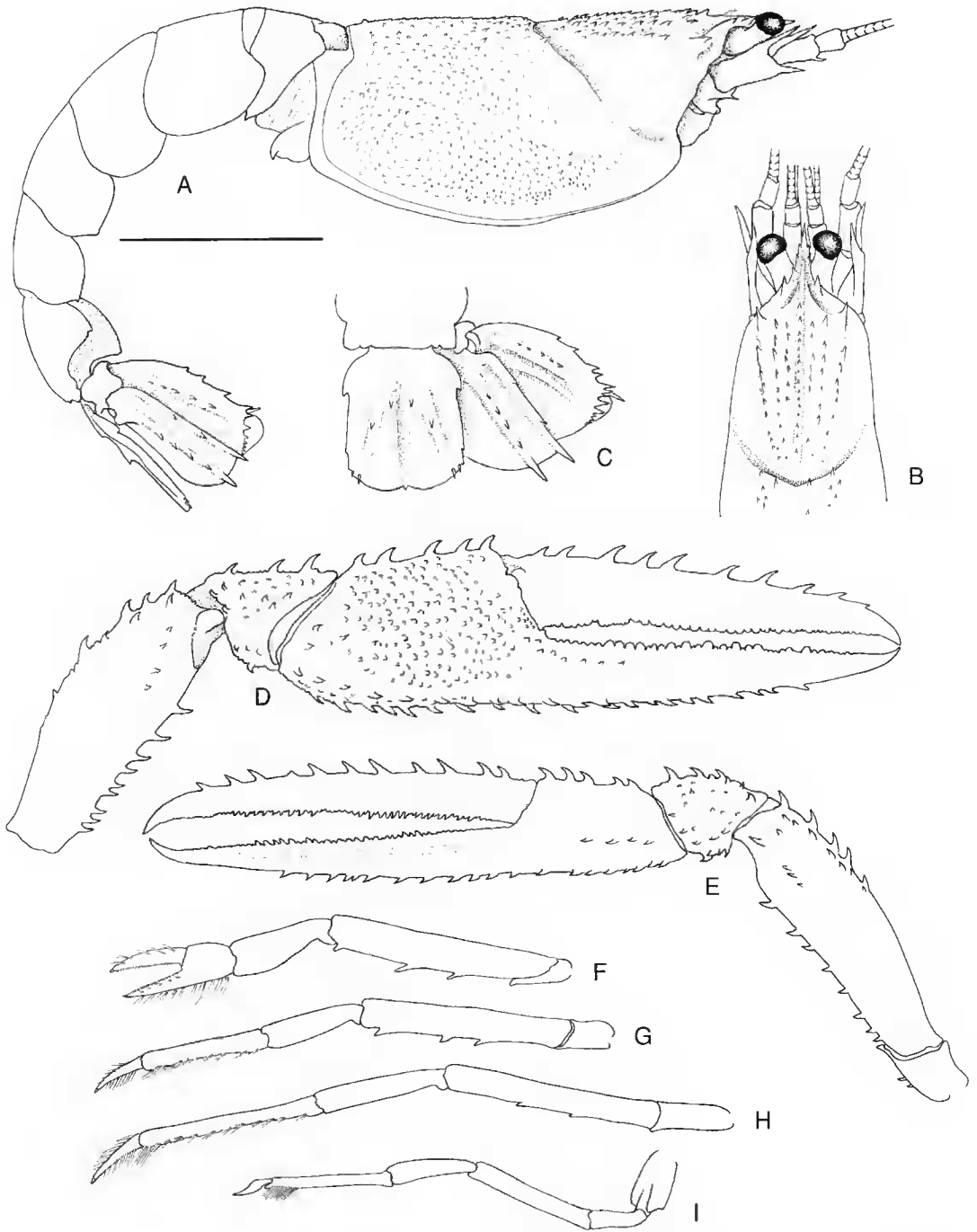


FIG. 2. — *Acanthaxius formosa* n.sp.: A, lateral view; B, anterior carapace in dorsal view; C, telson and right uropod; D, pereopod 1, larger cheliped, setae omitted; E, pereopod 1, smaller cheliped, setae omitted; F, pereopod 2; G, pereopod 3; H, pereopod 4; I, pereopod 5. Scale bar: 10 mm.

few spines on lateral surface, row of about twenty distally-directed spines on ventral margin running onto fixed finger; dactyl with eleven spines on dorsal margin; cutting edges of both fingers having acute and rounded tubercles and teeth. Pereopod 2 (Fig. 2F), merus with three spines on ventral margin. Pereopod 3 (Fig. 2G), merus with three spines on ventral margin. Pereopod 4 (Fig. 2H), merus with two small teeth on ventral margin. Pereopod 5 (Fig. 2I), merus unarmed. Uropodal lateral ramus having four spines on lateral margin, seven spines along suture, slender movable spine at junction, dorsal ridge bearing five small spines; mesial ramus with three spines on lateral margin, distalmost largest, five spines on dorsal ridge, distalmost largest (Fig. 2C).

Colour: body orange, ventrally lighter; abdomen with large pale lateral patches; legs orange, paler at articulations. Eyes dark brown.

REMARKS

Acanthaxius formosa belongs to the group of three species characterized by possessing a spinulose or granular postcervical carapace. Of these, it most closely resembles *A. polyacantha* (Miyake et Sakai, 1967) from the East China Sea. *A. formosa* differs from the earlier described species in having fewer denticles on the anterolateral carapace; fewer spines along the cervical carina; the postcervical carapace granular rather than spinulose; a more slender smaller chela; more (ten to eleven against seven) dorsal dactylar spines in the larger chela; and in having fewer spinules on the distolateral surface of the meri of the first pereopods.

Acanthaxius grandis n.sp. (Figs 1B, 3, 4)

MATERIAL EXAMINED. — **Tong-Kong.** Ping Tong County, south-western coast, sandy mud, about 400 m, 5.VIII.1996: holotype ♂ cl 33.5 mm (NTOU H-1996-8-5).

Paratype, Tong-Kong, Ping Tong County, south-western coast, about 400 m, 5.VIII.1996: ♂ cl 34.0 mm, lacking left pereopod 1 (USNM 253356). — Su-Aou, I-Lan County, north-eastern coast, sandy mud bottom, about 350 m, 1996: 1 ♂ cl 38.4 mm, 1 ♀ cl 39.6 mm (National Museum of Natural Science, Taiwan: 002701-00002). — Ta-Chi, I-Lan

County, north-eastern coast, sandy mud bottom, about 350 m, 10.IV.1998: 1 ♂ cl 37.7 mm (NTOU P-1998-4-10).

ETYMOLOGY. — The specific name refers to the large size of the animal. Along with *A. pilocheira*, at ≥ 34 mm carapace length, this is one of the larger *Acanthaxius* species.

DESCRIPTION

Carapace (Fig. 3A, B) with rostrum reaching well beyond eyes, reaching to distal margin of antennal peduncle article 4, with one or two pairs of lateral spines, and pair of strong supraorbital spines at base; median carina well-marked, reaching onto base of rostrum, bearing six spines; submedian carina having four spines (excluding supraorbitals); lateral carina having two spines; cervical groove strong, reaching anteroventrally to hepatic region; postcervical carapace glabrous. Pleuron of abdominal somite 1 ventrally narrowly triangular; pleura 2-4 ventrally broadly rounded; pleuron 5 posteriorly rectangular; pleuron 6 with tiny ventral rooth (Fig. 3A). Telson (Fig. 3C) slightly wider than long, with tiny posteromedian tooth, tiny movable posterolateral rooth, and two pairs of stronger dorsal spines.

Acicle of antenna slender, reaching distally to distal margin of peduncle article 4. Pereopod 1, larger cheliped (Fig. 4A), merus with eight spines on ventral margin, three spines on dorsal margin, and scattering of spines on distolateral surface; carpus with four to six spines on dorsal margin, scattered spines on lateral surface; propodus with four strong spines on dorsal margin, ventral margin bearing row of forwardly-directed, sometimes overlapping spines running onto ventral fixed finger, lateral surface with numerous scattered spines, fixed finger with lateral row of spines basally, becoming tubercles distally; dactyl having eleven to twelve spines on dorsal margin, five spines on proximolateral surface; cutting margins of both fingers bearing rounded tubercles. Pereopod 1, smaller cheliped (Figs 3D, 4B), merus with seven spines on ventral margin, three to four spines on dorsal margin, with several scattered spines on distolateral surface; carpus with six to seven spines on dorsal margin and several spines on lateral surface; propodus with three to four spines on dorsal margin, ventral

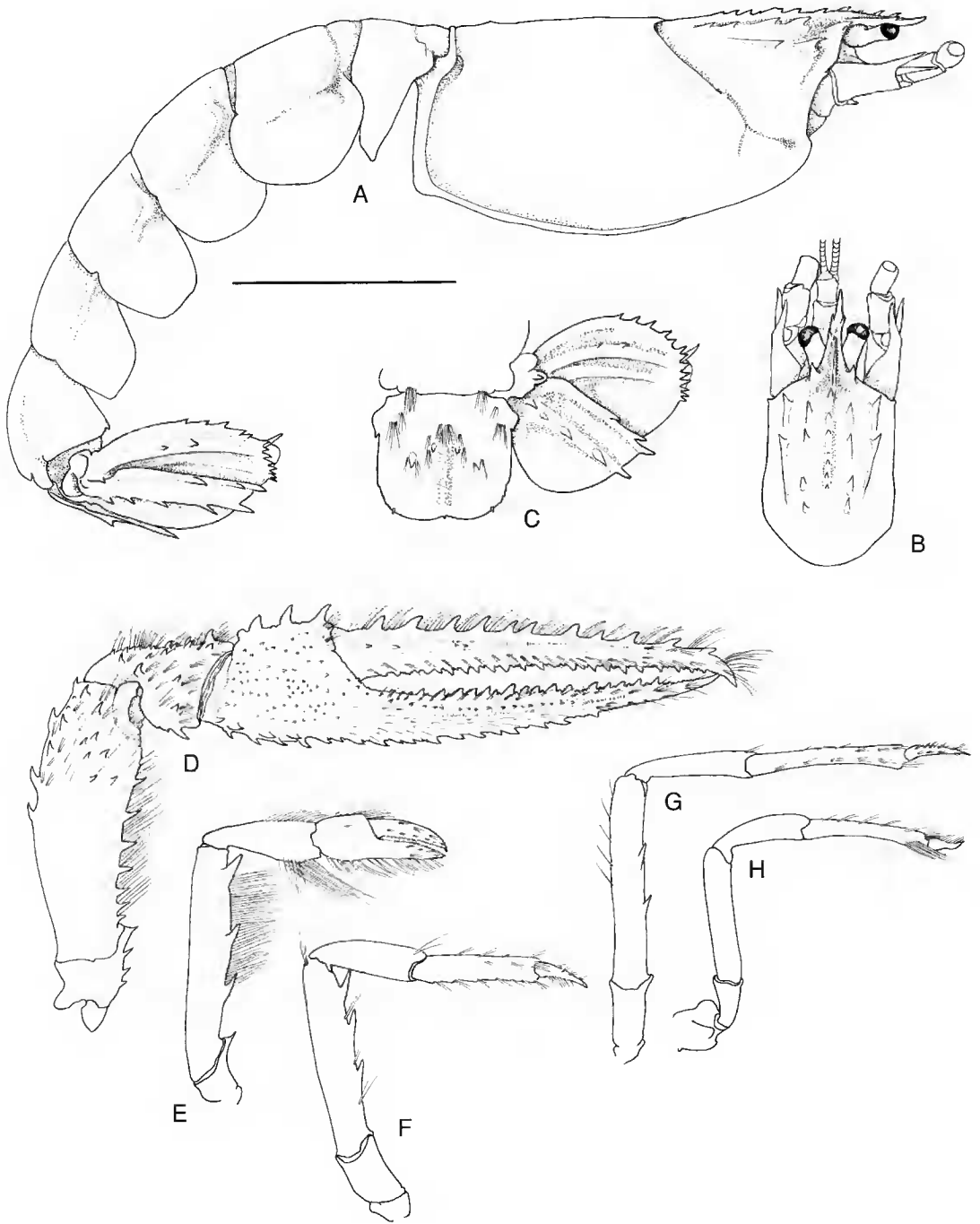


FIG. 3. — *Acanthaxius grandis* n.sp., paratype; **A**, lateral view; **B**, anterior carapace in dorsal view; **C**, telson and right uropod; **D**, pereopod 1, smaller cheliped, setae omitted; **E**, pereopod 2; **F**, pereopod 3; **G**, pereopod 4; **H**, pereopod 5. Scale bar: 20 mm.

margin consisting of row of distally-directed sometimes overlapping spines running onto fixed finger, lateral surface with numerous scattered spines, fixed finger with lateral row of spines becoming small tubercles distally; dactyl having eleven spines on dorsal margin, lateral row of spines becoming obsolete distally; cutting margins of both fingers having numerous alternating large and small acute teeth. Pereopod 2, merus with three strong teeth on ventral margin. Pereopod 3, merus with three teeth on ventral margin. Pereopod 4, merus with two teeth on ventral margin. Pereopod 5, merus unarmed. Uropodal lateral ramus having five to six spines along lateral margin, seven to eight spines along suture line, with a slender movable spine at junction, outer dorsal ridge bearing two spines; mesial ramus with three spines on lateral margin, five spines on dorsal ridge. Colour: body orange, ventrally lighter; legs orange-red. Eyes dark brown.

REMARKS

Of the five species of *Acanthaxius* that possess a glabrous postcervical carapace, the present species closely resembles *A. pilocheira* (Sakai, 1987) from Japan, especially in the relatively large size (\geq cl 34.0 mm in both). Several differences, however, can be seen between the two species. The antennal acicle is relatively longer in the new species; in the larger cheliped of pereopod 1, *A. pilocheira* has eight to ten dorsal daetylar spines, *A. grandis* has eleven; in the smaller, more slender cheliped of pereopod 1, the proportion of finger length to lateral propodus length differs (2.0 in *A. pilocheira*, 2.5 in *A. grandis*); in the uropod, there are more marginal spines (eight to ten) and more suture spines (nine to ten) on the lateral ramus of the earlier described species, than in the present species (five, eight), while the mesial ramus has three marginal spines (as opposed to four in the earlier described species). There are also differences in the shape of the

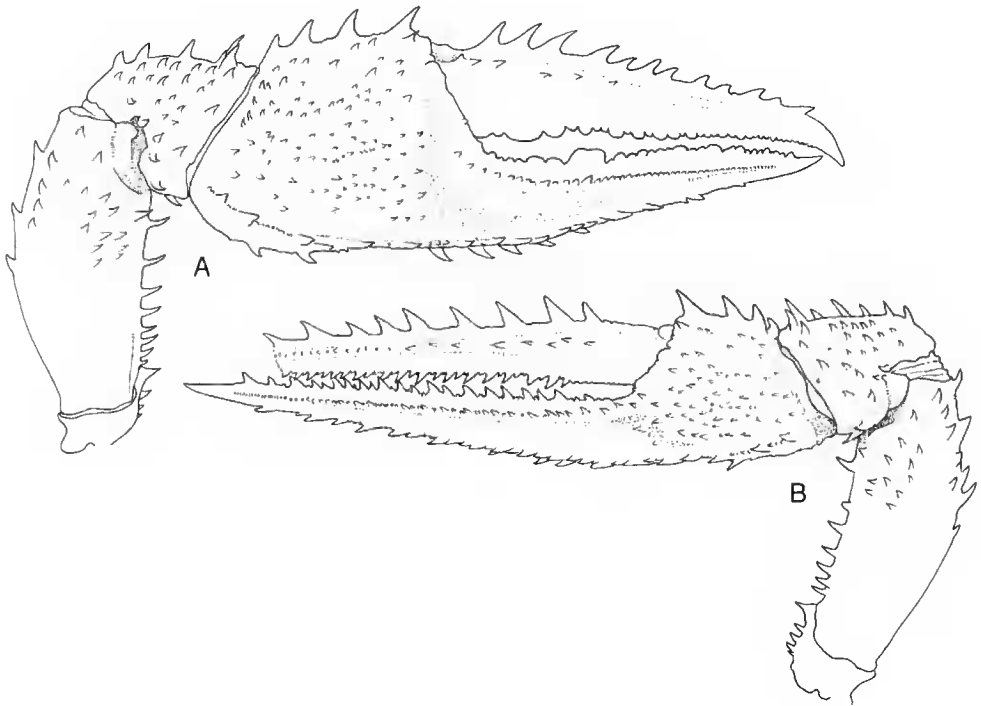


FIG. 4. — *Acanthaxius grandis* n.sp. holotype; A, pereopod 1, larger cheliped, setae omitted; B, pereopod 1, smaller cheliped, setae omitted.

abdominal pleura, especially pleuron 5 in the new species, which is posteriorly rectangular, rather than rounded as in *A. pilocheira*. While it is possible that these differences merely reflect a range of variation in a single species, they are certainly comparable to differences between species in other axiid genera.

Family CALOCARIDIDAE Ormann, 1891
Genus *Calastacus* Faxon, 1893

Calastacus crosnieri n.sp.
(Figs 1C, 5)

MATERIAL EXAMINED. — **Ta-Chi**, I-Lan County, north-eastern coast, sandy mud bottom, 350 m, 10.VI.1993: holotype hermaphrodite cl 13.0 mm (NTOU H-1993-6-10).

Paratypes: all from Ta-Chi, I-Lan County, north-eastern coast, sandy mud bottom, 350 m, 9.IX.1986: hermaphrodite cl 10.5 mm (NTOU P-1986-9-9). — 21.V.1988: hermaphrodite cl 11.3 mm (NTOU P-1988-5-21). — 22.VI.1989: hermaphrodite cl 11.5 mm (NTOU P-1989-6-22). — 27.V.1992: hermaphrodite cl 8.9 mm (NTOU P-1992-5-27). — 10.VI.1993: hermaphrodite cl 12.2 mm (NTOU P-1993-6-10). — 27.V.1994: 2 hermaphrodites cl 9.7 mm, 10.5 mm (NTOU P-1994-5-27). — 3.VII.1995: hermaphrodite cl 10.6 mm (NTOU P-1995-7-3). — 19.X.1995: 5 hermaphrodites cl 9.6-12.9 mm, 1 ovigerous hermaphrodite cl 11.3 mm (NTOU P-1995-10-19). — 19.VII.1996: ovigerous hermaphrodite cl 8.9 mm (NTOU P-1996-7-19). — 17.IV.1998: 4 hermaphrodites cl. 10.0-14.0 mm, 1 ovigerous hermaphrodite cl. 11.0 mm (NTOU P-1998-4-17). — 10.VI.1993: hermaphrodite cl. 10.0 mm (USNM 253355).

ETYMOLOGY. — The species is named with much gratitude for Dr. Alain Crosnier, esteemed colleague and carcinologist *par excellence*.

DESCRIPTION

Carapace (Fig. 5A, B) somewhat inflated, glabrous; cervical groove dorsally faintly indicated; rostrum spiciform, dorsally grooved, with strong supraocular spine at base; median carina weakly indicated, rounded, strongest at base of rostrum. Pleuron of abdominal somite 1 triangular, ventrally subacute. Pleura 2-6 ventrally broadly rounded (Fig. 5A). Telson (Fig. 5C) 1.7 times longer than basal width, having single tiny poste-

rolateral movable spine on each side, posterior margin evenly convex.

Eyes rounded, unpigmented, not contiguous. Acicle of antenna slender, acute, reaching mid-length of penultimate peduncular article. Pereopod 1 (Fig. 5G), chelipeds subequal, ischium bearing five ventral spines; merus with nine to ten spines on ventral margin, single distal spine on dorsal margin; carpus unarmed; propodal palm with single distal tooth on carinate dorsal margin; fingers 0.7 times length of propodal palm. Pereopods 2-5 (Fig. 5H-K) unarmed, pereopod 4 longest. Pleopod 1 (Fig. 5E), distal article broad, mesial margin sinuate with fused basal lobe bearing tiny hooks. Pleopod 2 (Fig. 5F), exopod slender, flagelliform; endopod of single article, followed by biarticulate appendix masculina, latter with distal article longest, both articles bearing dense band of stiff setae becoming shorter distally, appendix interna fused basally with appendix masculina. Uropodal lateral ramus having nine spines along distal oblique-transverse suture, movable spine at junction of lateral margin and suture; mesial ramus with single distal spine on lateral margin (Fig. 5C). Colour: body and eyes uniformly golden yellow.

REMARKS

The present material agrees well with the definition of *Calastacus*, provided by both de Saint Laurent (1972) and Kensley (1989), especially in the structure of pleopods 1 and 2.

Kensley (1996, table 2) compared the four known species of *Calastacus* on the basis of six characters. For these six characters, *C. crosnieri* has the following traits: the eyes are rounded and non-contiguous; pereopod 1, the dorsal margin of the merus has a single spine, the dorsal margin of the carpus is unarmed, the lateral surface of the propodus is unarmed; the mesial uropodal ramus has a single marginal spine; the lateral uropodal ramus has seven spines along the suture. All of these features are shared with *C. laevis* de Saint Laurent, 1972 from the eastern Atlantic. However, several differences separate these two species: the merus of pereopod 1 in the Atlantic species is armed with five spines on the ventral margin, ten in the Taiwanese species; the ischium bears three ventral spines in *C. laevis*, five in the

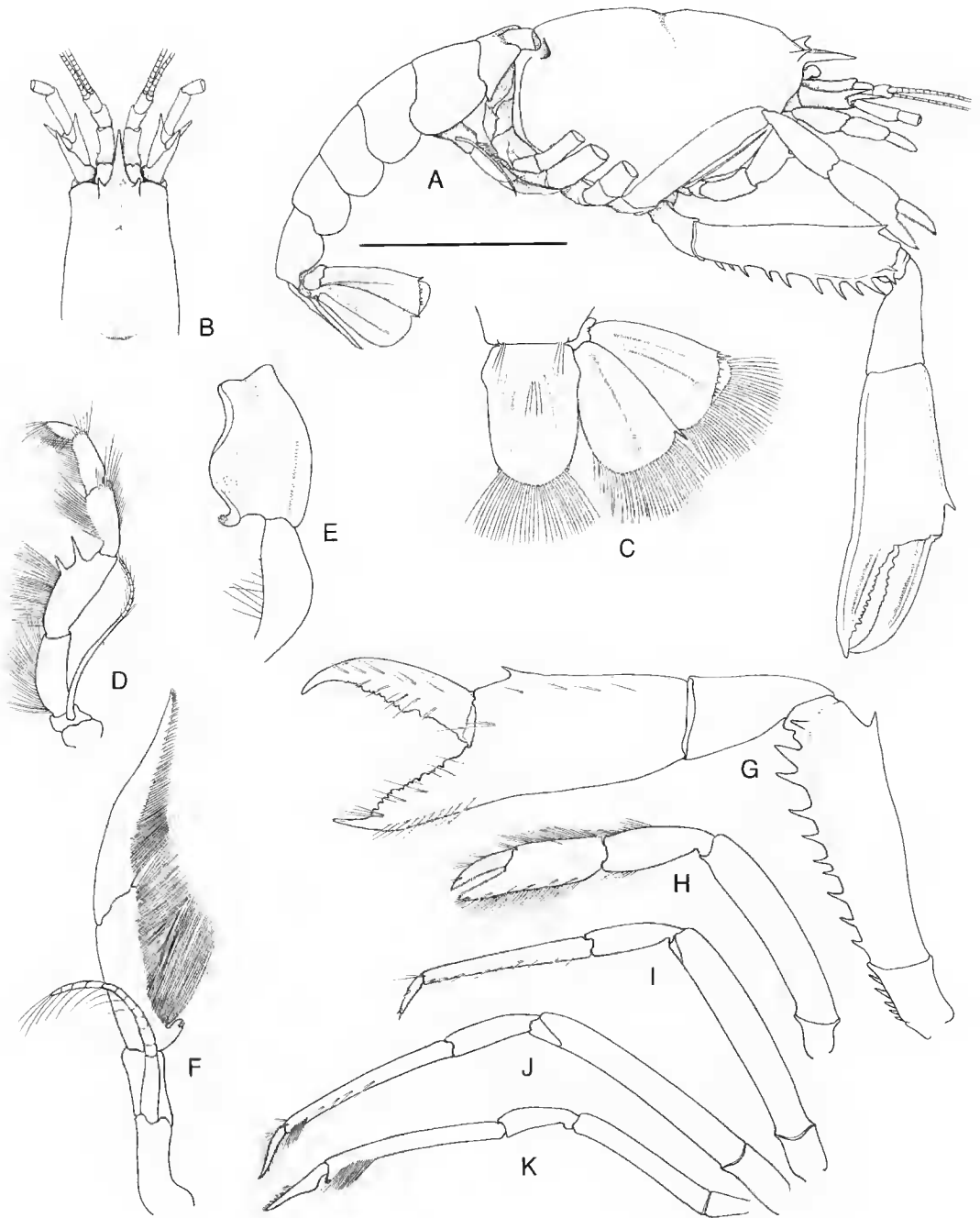


FIG. 5. — *Calastacus crosnieri* n.sp.; A, lateral view; B, anterior carapace in dorsal view; C, telson and right uropod; D, maxilliped 3; E, pleopod 1; F, pleopod 2; G, pereopod 1; H, pereopod 2; I, pereopod 3; J, pereopod 4; K, pereopod 5. Scale bar: 10 mm.

present species; pleopod 1 is distally more produced in the earlier species; the antennal peduncle reaches further beyond the antennular peduncle in the present species; the cervical groove of the carapace is more clearly defined in the earlier species. As only one specimen of *C. laevis* is known, and twenty two of the present species, conclusions based on size may not mean much, but *C. laevis* has a carapace length of 14.5 mm, while the present perhaps smaller species ranges from 8.9-14.0 mm.

Two of the specimens (cl 8.9 mm, 11.3 mm) are ovigerous. Eggs are about 0.5 mm in diameter, reaching 0.9 mm in diameter when close to hatching.

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REFERENCES

- Faxon W. 1893. — Reports on the dredging operations off the west coast of Central America to the Galapagos, to the west coast of Mexico, and in the Gulf of California, in charge of Alexander Agassiz, carried on by the U.S. Fish Commission Steamer "Albatross", during 1891, Lieut. Commander Z. L. Tanner, U.S.N., commanding. *Bulletin of the Museum of Comparative Zoology at Harvard College* 24 (7): 149-220.
- Huxley T. H. 1878. — On the classification and the distribution of the crayfishes. *Proceedings of the Zoological Society of London for the year 1878*: 752-788.
- Kensley B. 1989. — New genera in the thalassinidean families Calocarididae and Axiidae (Crustacea: Decapoda). *Proceedings of the Biological Society of Washington* 102 (4): 960-967.
- 1996. — New species of Calocarididae from the Caribbean Sea and Gulf of Mexico (Crustacea: Decapoda: Thalassinidea). *Bulletin of Marine Science* 59 (1): 158-168.
- Kensley B. & Komai T. 1992. — Redescription of *Calocarides soyoi* (Yokoya, 1933) from Japan (Crustacea: Decapoda: Axiidae). *Proceedings of the Biological Society of Washington* 105 (1): 81-85.
- Miyake S. & Sakai K. 1967. — Two new species of Axiidae (Thalassinidea, Crustacea) from the East China Sea. *Journal of the Faculty of Agriculture, Kynshu University* 14 (2): 303-310.
- Ortmann A. 1891. — Die Decapoden-Krebse des Strassburger Museums. 3. Die Abtheilungen der Reptantia Boas: Homaridae, Loricata und Thalassinidea. *Zoologischen Jahrbuchern* 6: 1-58.
- Saint Laurent M. de 1972. — Un thalassinide nouveau du golfe de Gascogne, *Calastacus laevis*, n.sp. Remarques sur le genre *Calastacus* Faxon (Crustacea, Decapoda, Axiidae). *Bulletin du Muséum national d'Histoire naturelle, série 3*, 35, Zoologie 29: 347-356.
- Sakai K. 1987. — Two new Thalassinidea (Crustacea: Decapoda) from Japan, with the biogeographical distribution of the Japanese Thalassinidea. *Bulletin of Marine Science* 41 (2): 296-308.
- 1992. — Axiid collections of the Zoological Museum, Copenhagen, with the description of one new genus and six new species (Axiidae, Thalassinidea, Crustacea). *Zoologica Scripta* 21 (2): 157-180.
- Sakai K. & Saint Laurent M. de. 1989. — A check list of Axiidae (Decapoda, Crustacea, Thalassinidea, Anomura), with remarks and, in addition, descriptions of one new subfamily, eleven new genera and two new species. *Naturalists (Tokushima, Japan)* 3: 1-104.
- Yokoya Y. 1933. — On the distribution of decapod crustaceans inhabiting the continental shelf around Japan, chiefly based upon the materials collected by S.S. *Soyo-Maru*, during the years 1923-1930. *Journal of the College of Agriculture, Tokyo Imperial University*, 12 (1): 1-226.